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Original Article

# Are psychological factors prognostic indicators of outcome in patients with sub-acute neck pain?

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ABSTRACT

The aim was to determine if psychological factors favourably influence the short and long-term outcome of patients with sub-acute neck pain in terms of global perceived recovery, pain, using a Numerical Rating Scale (NRS) and functional disability, using the Neck Disability Index (NDI).

This study was conducted within the framework of a randomised clinical trial comparing two types of conservative therapy in 146 patients with sub-acute neck pain. Multilevel techniques were used for data-analysis.

The short and long term results for the three outcomes were very diverse. The sub-scales of the used questionnaires, i.e. the Pain Coping and Cognition List (PCCL), and the 4 Dimensional Symptom Questionnaire (4DSQ), did not contribute significantly to all of the multilevel models. Only the factor 'fear of movement' was consistently and significantly present in the univariable analysis for all outcomes at both follow-up measurements. The explained variance in the short term ranged from 16% to 30%, and from 6% to 34% in the long term. This can be considered to be low.

We conclude that all psychological factors showed a considerable variation on the specific measurement and time point used. Only 'fear of movement' consistently impedes short term and long term recovery. Further prognostic research is needed to achieve more consistent results.



## 1. Introduction

Neck pain is a common musculoskeletal disorder. The point prevalence of neck pain in the general population varies between 9.5% and 22.0% (Borghouts et al., 1999; Picavet and Schouten, 2003), and each year approximately one-third of all adults will experience neck pain (Croft et al., 2001). The Quebec Task Force on Spinal Disorders (1987) discriminates between the acute phase (0–6 weeks), the sub-acute phase (6–12 weeks) and the chronic phase (longer than 12 weeks). Some 5–10% of all neck complaints will develop into chronic neck pain, the main feature of which is pain in the cervical region, often accompanied by restriction in the range of motion. This leads to functional limitations, for instance when looking over the shoulder or working with a computer (Ariens et al., 1999). The pain can arise from many structures in the cervical region, especially the spine and soft tissues, but there are no data on the prevalence of specific causes of acute or chronic neck pain (Bogduk and Barnsley, 2000) and there are no valid clinical means with which to distinguish one suggested cause of the pain from another. Therefore, the most accurate diagnosis in most cases is a-symptomatic or non-specific neck pain (Bogduk and Barnsley, 2000). Risk factors for the occurrence of neck pain are physical load factors, such as vibration, flexion of the neck, bad sitting posture, and heavy lifting (Ariens et al., 1999). In an extensive review, Linton (2000) found that psychological factors are related to neck pain and back pain from the onset to the chronic phase. Furthermore, psychological factors were found to be pivotal in the transition from acute to chronic pain, as well as influential in the onset of pain. Based on the results of that review, it can be hypothesised that these factors can influence the course of neck pain and the outcome of treatment strategies over time. However, Linton did not use any quality-rating methods to assess the articles in his review, and furthermore, in the primary care setting only two of the studies included neck pain, which was not analysed separately. Whether or not psychological factors predict a favourable outcome for sub-acute neck pain can therefore not be

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concluded from this review. Bot et al. (2005) found that psychosocial factors, such as passive coping and fear avoidance, also predicted the outcome of neck and shoulder symptoms.

Hill et al. (2007) reported predictors of poor outcome, such as lower social class, catastrophising, anxiety and depression, low treatment expectations, severity of baseline neck pain or disability, presence of co morbid back pain, and older age. In the literature the main field of interest is either whiplash-associated disorders (WAD) or neck pain as a separate entity. Factors associated with poor recovery in patients with WAD are high initial pain intensity, age, gender and high acute psychological responses (Cote et al., 2001; Scholten-Peeters et al., 2003). However, Hendriks et al. (2005) reported that care-providers could easily identify patients who were at risk for poor recovery with a simple visual analogue scale for initial pain intensity and work-related activities. The traumatic event that precipitates the onset of WAD may have different psychological consequences, and for that reason it is difficult to generalise the results to other neck pain conditions. Sterling et al. (2005) stated that both physical and psychological factors play a role in recovery from whiplash injury, and Nederhand et al. (2004) found that an additional test for fear of movement, in combination with a test for disability, can be used to predict future outcome.

There is increasing evidence that psychological factors can influence the course of pain, and can also play an important role in the development of chronic musculoskeletal disorders, but, the consistency of those findings is rather low. Nevertheless, for the further development of effective treatment strategies it is important to determine consistent factors that predict the clinical course of sub-acute neck pain.

In primary care, some prognostic factors are routinely included in history-taking, for example high pain levels, and a previous history of neck pain (Croft et al., 2001; Hoving et al., 2004), but a structural search for psychological factors is not common practice. Factors such as the attitudes and beliefs of the patient, coping, depression, psychological distress, illness behaviour and anxiety are all factors which, according to the bio-psychosocial model, can influence the course and experience of pain (Gatchel, 1996; Linton, 2000). Previous studies have investigated only a few psychological factors, with the use of mixed study populations, including patients with acute and chronic neck pain or patients with shoulder pain, and have reported inconsistent results. Therefore, we carried out a secondary analysis of data on patients with sub-acute neck pain, obtained from a randomised clinical trial in which a large number of psychological factors were studied.

Our objective was to determine psychological factors that predict the short and long-term outcome of sub-acute neck pain in terms of global perceived recovery, pain, and functional disability. In the analysis we took into account the variability of the practitioners (manual therapists and physical therapists), because inter-practitioner variability can be substantial, due to differences in practice organisation, professional norms, therapist style, and background.

## 2. Materials and methods

Our prognostic study was conducted within the framework of a randomised clinical trial on the effectiveness of manual therapy compared to a behavioural graded activity programme provided by physical therapists, for patients with sub-acute neck pain (Pool et al., 2006). In this trial it was concluded that on the primary outcome measures, i.e. Global Perceived Effect (GPE), Numerical rating scale for pain (NRS) and the Neck Disability Index (NDI), there was only a marginal difference of effect, in favor of the behavioural graded activity programme which only reached statistical significance on the NDI (Pool, 2007). At baseline, 146 patients completed a questionnaire which included questions about potential prognostic indicators such as gender, age, history of neck complaints, and severity of the pain (see Table 1). Furthermore, the 4 Dimensional Symptom Questionnaire (4DSQ), which is a valid questionnaire, with acceptable reliability (Terluin et al., 2006), was used to measure somatisation, distress, depression and fear. The Pain Coping and Cognition List (PCCL) (Stomp-van der Berg et al., 2001) was used to measure catastrophising, coping, and internal and external pain control. The PCCL is based on a compilation of the Pain Coping List, the Pain Control List and the Coping and Pain Questionnaire. The internal consistency of the PCCL seems to be good (Cronbach's $\alpha$ between 0.80 and 0.85), its test-retest reliability is moderate to good ($r$ between 0.64 and 0.79) and it has fair construct validity. Fear of movement was measured with the Tampa Scale for Kinesiophobia (TSK) (Kori et al., 1990), which has good internal consistency and substantial test-retest reliability. The level of chronicity was assessed with the Graded Chronic Pain Scale (GCPS) (Von Korff, 2000). The patient's preference or non-preference for therapy (manual therapy or physical therapy), and the general practitioner's attitude towards neck pain were assessed with the Pain Beliefs and Attitude Scale (Ostelo et al., 2003).

Potential non-psychological predictors such as age, severity of complaints (7-point Likert scale), headache (yes/no) and history of neck pain as reported in former studies, were also investigated, in order to assess the added value of psychological factors.

Three primary outcome measurements were defined and measured at 12 and 52 weeks.

1) Perceived recovery was rated by the patient on a 7-point ordinal rating scale (GPE) (Beurskens et al., 1996), ranging from 'completely recovered' to 'worse than ever'. Recovery was a priori defined as 'completely recovered' or 'much improved', as reported by the patient.
2) The severity of the neck pain was scored on an 11-point NRS. Recovery from pain was a priori defined as an NRS score of $\leq 1$.
3) Functional status was measured with the NDI (Vernon and Mior, 1991).

The Medical Ethics Committee of the VU University Medical Center in Amsterdam approved the study protocol.

**Table 1**
Summary baseline characteristics of study population.

| | |
|---|---|
| Total participants | 146 |
| Age | 45.1 (11.2) |
| Gender (% female) | 61 |
| History neck complaints (%) | 54.8 |
| Headache (%) | 61.4 |
| Mean pain (SD) | 5.3 (2.2) |
| NDI (SD) | 14.0 (6.8) |
| Tampa (SD) | 32.3 (6.1) |
| 4DSQ (SD): | |
| Distress | 8.6 (6.9) |
| Depression | 0.6 (1.6) |
| Fear | 1.7 (3.2) |
| Somatisation | 9.7 (4.5) |
| SF 36 (SD) | |
| Phys. component summary | 44.8 (7.3) |
| Mental component summary | 47.5 (12.2) |
| PCCL (SD) | |
| Catastrophising | 2.3 (0.9) |
| Coping | 3.4 (0.9) |
| Internal pain control | 3.7 (0.9) |
| External pain control | 3.1 (0.9) |

### 2.1. Statistical analysis

The relationship between each potential prognostic indicator and outcome was evaluated, adjusting for the randomly allocated intervention. The interventions were performed by a number of therapists, so we took patients clusters under therapists into account in the analysis, and a multilevel analysis was performed, with two levels: patients and therapists. For continuous data, i.e. from the NDI, a linear regression model was fitted in a four-step strategy, applying the likelihood ratio test with a significant level of 10% (Collet, 1994). The four steps are: 1) The univariable step, in which the −2 log likelihood (−2LL) is compared with the null model, which consists of the intercept and therapy, to determine which variable significantly reduces the value of this statistic. 2) These variables are then included in a multivariable model, and variables which do not significantly increase the value of the −2LL when they are omitted from the model are removed. 3) Variables which were not important in the first step may become important in the presence of others, and such variables are added to the model constructed in step 2, one at a time, to see if there is any significant reduction in the −2LL. 4) A final check is made to ensure that none of the variables in the model can be omitted without significantly increasing the value of −2LL.

For dichotomous outcomes such as the GPE and the NRS we constructed a logistic regression model in which the odds ratio (OR) and 95% confidence interval (CI) were calculated. The same 4-step strategy was adhered to, but instead of using the likelihood ratio test, we used the Wald-statistic test. Again, a level of significance of 10% was set for the model strategy. All analysis were performed in MLWin 2.02.

## 3. Results

Between January 2003 and December 2004, 146 patients were included in the trial. At the 52 week follow-up 18 patients had dropped out, but 8 of these patients had provided information by phone about their perceived recovery. Therefore, the analysis included 146 eligible patients at 12 weeks, and 128 eligible patients at 52 weeks, with the exception of the GPE outcome which included the scores of 136 patients.

Table 2 shows the results of the three outcomes measured at 12 and 52 weeks.

### 3.1. Perceived recovery (GPE)

Table 3 presents the prognostic indicators of perceived recovery at 12 weeks. The univariable analysis showed that less fear of movement, gender (female), and the absence of headache were significantly associated with a favourable outcome. Preference for physical therapy also predicted a more favourable outcome, although this was not statistically significant. In the multivariable analysis, only headache and preference for physical therapy were significant predictors of outcome. The explained variance in the model (McKelvey and Zavoina, 1975) was 17%.

**Table 2**
Recovery, pain and disability among sub-acute neck pain patients at 12 and 52 week.

| Outcomes | 12 weeks | 52 weeks |
|---|---|---|
| Perceived recovery (%) | 70.5% | 77.2% |
| NRS score ≤1 (%) | 48.6% | 68.2% |
| NDI (0–50) (mean and SD) | 5.7 (5.4) | 4.5 (5.2) |

NRS = Numerical Rating Scale for pain, NDI = Neck Disability Index, SD = standard deviation.

The univariable analysis at 52 weeks (not presented) showed an association only for fear of movement, OR = 0.92 (CI = 0.87–0.99), less fear of movement being associated with a favourable outcome. The explained variance ($R^2$) in this model was 6%.

### 3.2. Pain (NRS)

Table 4 presents the prognostic indicators of pain at 12 weeks, and the results of univariable analysis show the contribution of catastrophising, fear of movement, somatisation, fear, gender, headache and severity of complaints. In the multivariable model, fear of movement, male gender and less severe complaints significantly impeded recovery. The explained variance in this model was 16%. The univariable analysis at 52 weeks (not presented) showed a significant association only for distress, the explained variance ($R^2$) in this model was 6%.

### 3.3. NDI

Table 5 presents the prognostic indicators of the NDI at 12 weeks. In the univariable analysis, all indicators except coping, severity of complaints and patient preference for therapy were significantly associated with the score at 12 weeks. In the multivariable model, fear of movement, somatisation, male, age and the score of the GCPS score, especially 'moderately limiting' compared to 'low intensity of complaints', impeded recovery and internal pain control was associated with a more favourable outcome. The explained variance ($R^2$) in this model was 30%.

The univariable analysis at 52 weeks (not presented) showed an association with the outcome for catastrophising, fear of movement, somatisation, fear, distress, gender, headache, and the GCPS and NDI scores at baseline. After inclusion in a multivariable model, only low GCPS scores and the baseline NDI score were associated with the a favourable outcome. The explained variance ($R^2$) in this model was 34%.

Table 6 presents a summary of all the prognostic factors found in the multivariable analyses.

## 4. Discussion

Our objective was to determine psychological prognostic indicators of the short and long-term outcome of sub-acute neck pain in terms of perceived recovery, pain and functional disability. The results of this study present a diverse picture. The only factor which was more or less consistently present in the univariable analysis for all measurements, except for pain at 52 weeks, was fear of movement (TSK). All other factors showed a considerable variation on the specific measurement and time point used.

The GCPS score and especially the factor 'highly disabling-pain with moderate activity limitations' for the NDI outcome, was a significant prognostic factor in the multivariable analysis at both 12 weeks and 52 weeks (see Table 5). The explained variance in these models was 30% and 34%, respectively, which can be considered to be reasonable, at both measurement points, the categories of the PCCL and the 4DSQ contribute very little for all outcomes. This could be due to the fact that the mean scores for the different psychological domains of these questionnaires fluctuate around normal, so there are no patients with extremely high or extremely low scores. A score of ≥3.5 in each category of the PCCL (range 1–6) is considered to be high (Stomp-van der Berg et al., 2001). For catastrophising, the mean value was 2.3 (0.9), and 11% of the patients had a high score; for coping the mean was 3.4 (0.9), and 56% had a high score; for internal pain control the mean was 3.8 (0.9), and 41% had a high score; for external pain control the mean was 3.1 (0.9), and 21% had a high score. This leads to the conclusion

**Table 3**
Results of the univariable and multivariable multilevel analysis[a] of perceived recovery at 12 weeks ($n = 146$).

| | Univariable *b* (SE) | OR (95% CI) | Multivariable *b* | OR (95% CI) |
|---|---|---|---|---|
| PCCL | | | | |
| Catastrophising | −0.562 (0.485) | 0.57 (0.22–1.47) | | |
| Coping | 0.197 (0.211) | 1.22 (0.81–1.84) | | |
| Internal pain control | 0.180 (0.207) | 1.20 (0.80–1.80) | | |
| External pain control | 0.081 (0.038) | 1.08 (0.73–1.61) | | |
| TSK | −0.051 (0.030) | 0.95 (0.90–1.00) | | |
| 4DSQ | | | | |
| Somatisation | −0.032 (0.040) | 0.96 (0.90–1.05) | | |
| Fear | −0.237 (0.225) | 0.79 (0.51–1.23) | | |
| Distress | −0.070 (0.205) | 0.93 (0.62–1.39) | | |
| Depression | −0.290 (0.321) | 0.75 (0.40–1.40) | | |
| Gender (♂) | −0.686 (0.369) | 0.50 (0.23–0.91) | | |
| Age | −0.011 (0.016) | 0.99 (0.96–1.02) | | |
| Headache | −1.245 (0.461) | 0.29 (0.12–0.71) | −1.303 (0.467) | 0.27 (0.11–0.68) |
| Severity of complaints | 0.049 (0.127) | 1.05 (0.82–1.34) | | |
| History of neck complaints | −0.444 (0.374) | 0.64 (0.31–1.34) | | |
| Patient preference | | | | |
| None (ref) | | | | |
| pt | 1.399 (0.783) | 4.05 (0.87–18.8) | 1.525 (0.794) | 4.60 (0.97–21.79) |
| mt | 0.545 (0.464) | 1.72 (0.69–1.45) | | |
| GCPS (grade) | | | | |
| 1 = low intensity (ref) | | | | |
| 2 = high intensity | 0.585 (0.584) | 1.79 (0.57–5.64) | | |
| 3 = moderately limiting | −0.489 (0.689) | 0.61 (0.16–2.27) | | |
| 4 = severely limiting | 0.262 (0.696) | 1.30 (0.33–5.08) | | |
| GP attitude | | | | |
| Purely biomedical (ref) | | | | |
| More biomedical | −0.755 (0.529) | 0.47 (0.17–1.32) | | |
| Neutral | 0.772 (0.550) | 2.16(0.74–6.36) | | |

Explained variance $R^2 = 17\%$.
SE = standard error, OR = odds ratio, CI = 95% confidence interval, *b* = regression-coefficient, ref = reference category, pt = physical therapy, mt = manual therapy, GP = general practitioner, PCCL = Pain Coping and Cognition List, 4DSQ = 4 dimension psychological symptomatology questionnaire, GCPS = Graded Chronic Pain Scale, TSK = Tampa Scale of Kinesiophobia.
[a] Two levels: patient and therapists, adjusting for therapy.

that only internal pain control at baseline can be considered as substantial. This factor was found to be significantly associated with outcome in a multivariable analysis of the NDI score at 12 weeks.

The cut-off point for the 4DSQ varies per dimension but, taking into account the level "more severe than normal" (Terluin, 1998), 35% of the patients had a mean score of 8.6 (6.9) for distress and a cut-off point of 10, 20% had a mean score of 0.6 (1.6) for depression with a cut-off point of 2, 4% had a mean score of 1.7 (3.2) for fear with a cut-off point of 8, and 36% had a mean score of 9.7 (4.5) for somatisation with a cut-off point of 10. These can be considered as low scores for psychological factors. Unfortunately, this resulted in very small sub-groups of patients with extreme scores. So there was too little contrast in these psychological domains. However, the trial sample reflects the situation in clinical practice. According to Gatchel (1996), psychological and social factors are believed to play a role in the transition from acute to chronic pain. However, in the present sample, patients with sub-acute neck pain did have a low score for most of the psychological factors at baseline and at follow-up.

Another limitation of this study was the study population. It can be questioned whether a secondary analysis of an RCT is a representative sample for a prognostic study. Although frequently reported in the literature, a prognostic design would be more appropriate. We think that, by correcting for therapist and treatment in the analysis, we were able to come close to an optimal prognostic design. The sample size ($n = 146$) was also modest, considering the number of variables entered into the model.

Comparing our findings with prognostic factors reported in the literature, we noticed that our diverse picture is no exception. Although the patient population in the present study was almost the same as in the Hoving study (Hoving et al., 2004), factors such as age and previous history of neck pain were not important factors in our study, although we did include the same general practitioners and the same location, but different domains of interests, and sub-acute neck pain instead of neck pain (15% of which was sub-acute). In another study, Rubinstein et al. (2008) used the same outcome measures as we used in the present study, and concluded that the only variable that was consistently found to be predictive of a favourable outcome was a shorter duration of neck pain at the first visit.

In the present study we used the TSK, which was specifically developed for the assessment of low back pain. It can be questioned whether fear of movement is the same for patients with back pain as for patients with neck pain, or is fear of movement more domain-specific? Nevertheless, most of the psychological factors investigated in the present study were not consistent in their prediction of the three outcomes: perceived recovery, pain and disability.

In conclusion much attention is paid to psychological factors in the development or maintenance of pain and disability. This paradigm shift from a biomedical approach to a more bio-psycho-social approach is evident in clinical practice, but there is no core set of prognostic psychological factors that predict the outcome of neck pain over time. This is confirmed by the results in the present study. In a recent best evidence synthesis (Carroll et al., 2008) it was also concluded that psychological factors are important, and a poor psychological health status was found to be associated with a poor prognosis. However the impact of psychological factors was at least

**Table 4**
Results of the univariable and multivariable multilevel analysis[a] of pain at 12 weeks.

| | Univariable *b* (SE) | OR (95% CI) | Multivariable *b* (SE) | OR (95% CI) |
|---|---|---|---|---|
| PCCL | | | | |
| Catastrophising | −0.862 (0.452) | 0.42 (0.17–1.02) | | |
| Coping | −0.119 (0.190) | 0.89 (0.60–1.30) | | |
| Internal pain control | 0.020 (0.188) | 1.22 (0.71–1.47) | | |
| External pain control | −0.035 (0.180) | 0.97 (0.68–1.38) | | |
| TSK | −0.059 (0.029) | 0.94 (0.89–1.00) | −0.079 (0.031) | 0.92 (0.87–0.98) |
| 4DKL | | | | |
| Somatisation | −0.085 (0.040) | 0.92 (0.85–0.99) | | |
| Fear | −0.561 (0.230) | 0.57 (0.36–0.90) | | |
| Distress | −0.322 (0.198) | 0.72 (0.50–1.05) | | |
| Depression | −0.418 (0.320) | 0.66 (0.35–1.23) | | |
| Gender (♂) | −0.967 (0.350) | 0.38 (0.19–0.76) | −1.147 (0.374) | 0.32 (0.15–0.66) |
| Age | −0.000 (0.014) | 1.00 | | |
| Headache | −0.496 (0.355) | 0.60 (0.30–1.23) | | |
| Severity of complaints | 0.255 (0.124) | 1.29 (1.10–1.65) | 0.299 (0.130) | 1.35 (1.05–1.74) |
| History of neck complaints | −0.031 (0.335) | 0.97 (0.48–1.94) | | |
| Patient preference | | | | |
| None (ref) | | | | |
| pt | 0.845 (0.543) | 2.33 (0.81–6.70) | | |
| mt | 0.151 (0.407) | 1.16 (0.80–2.58) | | |
| GCPS (grade) | | | | |
| 1 = low intensity (ref) | | | | |
| 2 = high intensity | 0.284 (0.554) | 1.33 (0.45–3.93) | | |
| 3 = moderately limiting | −0.043 (0.671) | 0.96 (0.26–3.59) | | |
| 4 = severely limiting | −0.179 (0.660) | 0.84 (0.23–3.05) | | |
| GP attitude | | | | |
| Purely biomedical (ref) | | | | |
| More biomedical | 0.400 (0.520) | 1.49 (0.54–4.13) | | |
| Neutral | 0.784 (0.490) | 2.19 (0.89–5.72) | | |
| Pain at baseline | −0.096 (0.079) | 0.91 (0.84–5.72) | | |

Explained variance $R^2 = 16\%$.
SE = standard error, OR = odds ratio, CI = 95% confidence interval, *b* = regression-coefficient, ref = reference category, pt = physical therapy, mt = manual therapy, GP = general practitioner, PCCL = Pain Coping and Cognition List, 4DSQ = 4 dimension psychological symptomatology questionnaire, GCPS = Graded Chronic Pain Scale, TSK = Tampa Scale of Kinesiophobia.
[a] Two levels: patient and therapists, adjusting for therapy.

moderate, probably due to differences in study populations, study settings and definitions of outcome. Furthermore, it is hard to identify consistent psychological prognostic factors with the variety of questionnaires that are used, and the minimal contrast in the psychological variables that was found in the present study. In clinical practice it is thought that sub-acute neck pain can become chronic in patients with, for instance, passive coping and fear of movement, but it is still difficult to underpin this seemingly evident assumption with scientific evidence.

In clinical practice, understanding of the clinical course of neck pain is important for decision-making concerning the management of neck pain. The only factor which appeared more or less consistent in all outcomes in the present study was fear of movement. Furthermore, patient expectations, internal pain control, somatisation, severity of complaints and highly disabling-pain with moderate activity limitations were significant prognostic factors on one specific outcome selected or on one time point used.

**Table 5**
Results of the univariable and multivariable multilevel analysis[a] of the NDI at 12 weeks.

| | Univariable *b* (SE) | −2LL | Multivariable *b* (SE) | −2LL (model) |
|---|---|---|---|---|
| Therapy (mt) | 0.0515 (0.872) | 899.552 | | 847.527 |
| PCCL | | | | |
| Catastrophising | 3.311 (1.116) | 891.904 | | |
| Coping | 0.106 (0.497) | 899.507 | | |
| Internal pain control | −0.884 (0.486) | 896.285 | −1.378 (0.434) | |
| External pain control | 1.011 (0.467) | 894.944 | | |
| TSK | 0.198 (0.070) | 891.761 | 0.176(0.062) | |
| 4DSQ | | | | |
| Somatisation | 0.311 (0.094) | 888.722 | 0.174 (0.089 | |
| Fear | 1.691 (0.537) | 889.974 | | |
| Distress | 1.332 (0.475) | 891.854 | | |
| Depression | 1.709 (0.789) | 894.934 | | |
| Gender (♂) | 3.611 (0.859) | 887.755 | 3.334 (0.797) | |
| Age | 0.078 (0.037) | 895.275 | 0.077 (0.033) | |
| Headache | 2.618 (0.899) | 891.317 | | |
| Severity of complaints | 0.112 (0.316) | 899.419 | | |
| Patient preference | | 896.795 | | |
| None (ref) | | | | |
| pt | 0.036 (1.346) | | | |
| mt | −1.732 (1.056) | | | |
| GCPS (grade) | | 858.778 | | |
| 1 = low intensity (ref) | | | | |
| 2 = high intensity | −0.048 (1.397) | | −0.954 (1.234) | |
| 3 = moderately limiting | 3.648 (1.691) | | 3.189 (1.509) | |
| 4 = severely limiting | 1.656 (1.656) | | −0.072 (1.548) | |
| GP attitude ($n = 125$) | | | | |
| Purely biomedical (ref) | | | | |
| More biomedical | −0.275 (1.355) | | | |
| Neutral | −2.150 (1.276) | | | |
| NDI-baseline | 0.230 (0.061) | 885.519 | | |

Explained variance $R^2 = 30\%$.
*b* = regression-coefficient, SE = standard error, −2LL = −2 Log Likelihood, ref = reference category, pt = physical therapy, mt = manual therapy, GP = general practitioner, PCCL = Pain Coping and Cognition List, 4DSQ = 4 dimension psychological symptomatology questionnaire, GCPS = Graded Chronic Pain Scale, TSK = Tampa Scale of Kinesiophobia.
[a] Two levels: patient and therapists, adjusting for therapy.

**Table 6**
Summary of prognostic factors after multilevel analysis.

| Variable | 12 weeks | | | 52 weeks | | |
|---|---|---|---|---|---|---|
| | NDI | GPE | Pain | NDI | GPE | Pain |
| PCCL | | | | | | |
| Catastrophising | | | | | | |
| Coping | | | | | | |
| Internal pain control | x | | | | | |
| External pain control | | | | | | |
| TSK | x | | x | | x | |
| 4DSQ | | | | | | |
| Somatisation | x | | | | | |
| Fear | | | | | | |
| Distress | | | | | | x |
| Depression | | | | | | |
| Gender | x | | x | | | |
| Age | x | | | | | |
| Headache | | x | | | | |
| Severity of complaints | | | x | | | |
| History of neck complaints | | | | | | |
| Patient preference | | x | | | | |
| GCPS (grade) | x | | | x | | |
| GP attitude | | | | | | |
| NDI baseline score | | | | x | | |

GPE = Global Perceived Effect, NDI = Neck Disability Index, PCCL = Pain Coping and Cognition List, 4DSQ = 4 dimension psychological symptomatology questionnaire, GCPS = Graded Chronic Pain Scale, TSK = Tampa Scale of Kinesiophobia, GP = general practitioner.

Such inconsistent results were also found in other studies in recent literature.

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